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AGRICULTURAL NEWS LETTER

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The AGRICULTURAL NEWS LETTER serves as a medium of reporting new developments and new ideas in the field of agriculture, particularly as they are related to advancements through research. Material appearing herein may be reprinted in whole or in part, in the interest of advancing the general knowledge of new agricultural practices.

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WHAT FARM EDITORS ARE SAYING --

"The net effect of better ways of doing things is to create rather than to destroy jobs. And more people working means greater demand for farm products." -- Raymond H. Gilkeson in KANSAS FARMER

"An individual is only as strong as is his developed ability to think through and solve by his own ingenuity and initiative many of the problems confronting him. True, he can't solve all of them alone. But, the strongest and most progressive are those who call for help only when it is necessary and needed." -- Herbert L. Schaller in BETTER FARMING METHODS

"No business or industry lasts for long without interesting the younger generation in its methods, its achievements, and its rewards." -- Dick Meister in AMERICAN VEGETABLE GROWER

"The up-and-coming farm wife has better uses for her time than making soap. I believe the busy farmer is in much the same frame of mind when it comes to 'do-it-yourself' things of any size." -- Kirk Fox in SUCCESSFUL FARMING

"Farm people enjoy a more wholesome community life, are more religious, live longer, and in many respects, lead a happier, healthier life than city people -- and after all, what's more important than health and happiness?" -- J. O. Matlick in THE TENNESSEE FARMER

"If high consumer income means anything, there should be good times ahead in the livestock business. There's every indication that the country is going to be prosperous for some time to come." -- Nelson R. Crow in WESTERN LIVESTOCK

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LOW-COST FIELD DRAINAGE WITH

PERFORATED POLYETHYLENE PIPE

Perforated polyethylene pipe seems to offer a low-cost answer to many field drainage problems, according to information from five years of testing and research by an Ohio firm.

The polyethylene tubing used ranged from one to three inches in diameter. Along the upper surface of the pipe, as it is placed in the ground, are two lines of quarter-inch holes -- 12 holes to the foot, with the lines spaced 120 degrees apart.

With either mole or subsoiler attachments on standard tractor plow equipment, it is possible to lay down the drainage as fast as a furrow can be plowed. Total costs, the manufacturer claims, run less than half as much as for other land drainage methods.

Advantages claimed for polyethylene over other types of tile or metal drainage pipe include the immunity of this material to rot, rust, or electrolytic corrosion.

The various diameters of this drainage tubing are made in a range of wall thicknesses. Roughly, the thicker walls are recommended for use in sandy, crumbly soil; the thinner walled tubing for heavy, clay soil. Although the tubing is flexible, tests have shown that since pressure on buried pipe is practically equal on all sides there is no trouble from sides of the pipe becoming depressed.

While the diameter of tubing used depends on the amount of carry-off required, in most instances it has been found that the 1½-inch diameter is quite adequate. This size tubing is said to be roughly equivalent in efficiency to a five-inch drain tile.

A minimum depth of 18 inches is recommended. However, this may vary with soil types. Tighter soils usually require shallower drainage. Likewise, depth of the line determines spacing between lines. A rule-of-thumb worked out in tests is to allow two feet between lines for every inch of depth. As with other types of drainage, a fall of at least six inches per 100 feet is required in laying the tubing.

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NEW SNAKE BITE KIT -- Where poisonous snakes are a hazard, a wise addition to the farm first aid kit might be a compact little unit for snake bite treatment now being marketed by a West Coast firm. Most of the parts are molded from "Zytel" nylon resin, which means it is light in weight, tough enough to withstand extremely rough use without breaking, and can be sterilized in boiling water without risk of cracking or losing shape.

POULTRY WATERING CUP

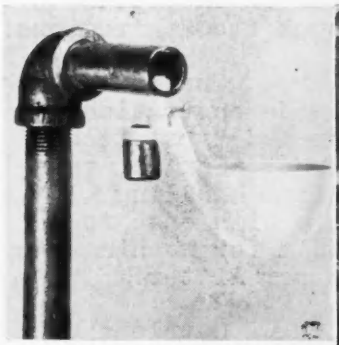
LATEST USE FOR NYLON

A new use for nylon -- in drinking cups for chickens -- has been developed recently by a firm in California's San Fernando Valley.

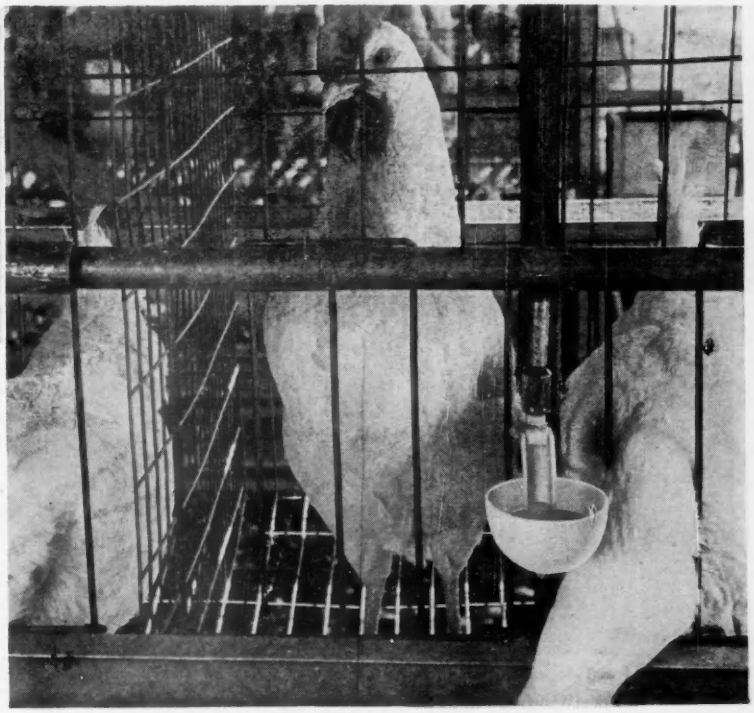
Employing a novel design to provide the self-filling feature, the cup is molded of "Zytel" nylon resin. This material combines light weight with exceptional toughness. It is easily cleaned and, in fact, can be sterilized in boiling water without damage if such measures seem necessary in connection with a disease clean-up or other sanitary program.

The cup combines a threaded plug which can be screwed into an eighth-inch pipe sleeve with a counter-balanced cup hinged on the fitting. When the cup is full, weight of the water presses a small rubber bit against the opening in the fitting and stops further flow of water. Water levels from one to four feet above the location of the cup provide all the pressure needed to keep the cup filled.

The nylon cup is built so it can be easily cleaned by simply tipping it up. The position and design of the valve is calculated to prevent clogging and the overflowing of the cup. While it was designed primarily for use with battery laying cages, the cup works equally well with other types of housing.



Close-up of drinking cup installation. Pipe end is open to show how plastic tap is inserted.



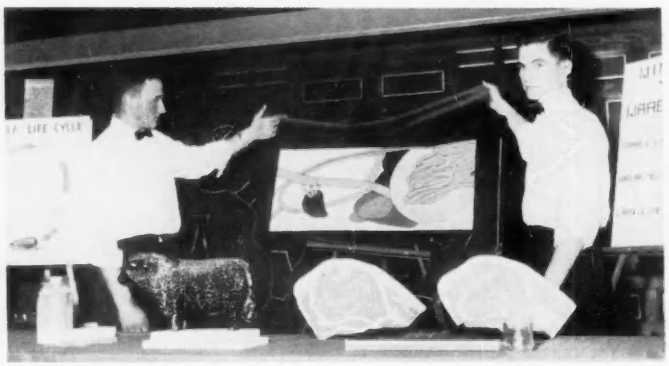
(At right) A typical installation of the new nylon drinking cup to serve laying cages.

PRIZE WINNERS KILL PARASITES

A cardboard "Angus steer" that did a strip-tease act helped a boy from Minnesota and his pal from Iowa win a national championship during the recent International Livestock Show in Chicago.

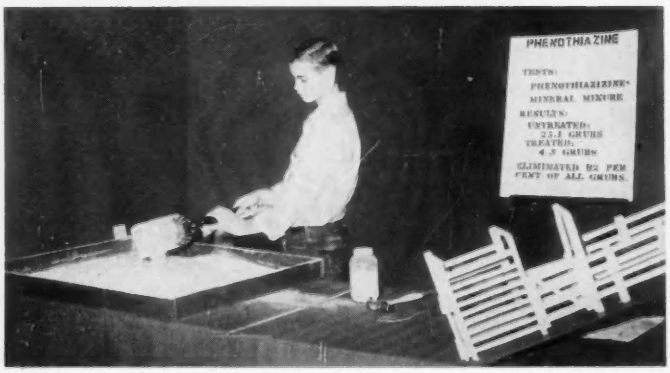
The boys are Gail Sutter of Guckeen, Minn., and Delbert Stoner of Dolliver, Iowa. Their presentation, entitled "Winning the Warble War," took top honors in a national 4-H livestock conservation demonstration contest sponsored annually by Livestock Conservation, Inc., a non-profit educational and research organization maintained by the livestock and meat industry.

The steer came equipped with loose flaps of black flannel "hide" which allowed the boys to expose internal organs through which larvae of the cattle grub (or ox warble) migrate, and the section of the loin and back where these grubs degrade meat cuts and finally puncture holes in the hide and emerge. In connection with this interior view, they explained how the feeding of a mixture of phenothiazine and minerals, designed for intestinal worm control, has been observed to cut cattle grub emergence by 82 per cent, through killing the larvae as they pass through stomach regions.



Gail Sutter (left) and his 4-H partner, Delbert Stoner, lift the "hide" on a black cardboard steer to show internal organs where low-level dosages of phenothiazine can break the life cycle of the cattle grub. Their demonstration on control of this pest won top honors in the recent national livestock conservation contest in Chicago.

Theirs was one of 14 demonstrations presented by state and regional winners, ranging from handling cattle with ease to a formula for weaning more pigs per litter.



Bob Jackson of Independence, Mo., demonstrates the mixing of phenothiazine and minerals for treatment of internal parasites in cattle.

Cattle grubs, the boys declared, account for an estimated loss of 12,000,000 pounds of meat a year, and a simultaneous loss of around $20,000,000 to the tanning industry through the ruining of hides for shoe soles and other leather goods. They traced the life cycle of this pest from the time the heel fly

Fred Boyd of North Brookfield, Mass., holds a jar of "blood" to indicate the seasonal loss per cow when bloodthirsty hornflies are on the rampage.

lays eggs in the hair around the legs and belly of cattle, through the emergence of the grub from the cow's back, its pupation in the ground, and hatching into another heel fly.

Besides the promising use of phenothiazine to cut this life cycle, which they depicted as still in the experimental stage, they demonstrated the use of that old standby, rotenone, as a dust, a spray, a dip, or a washing solution to be applied to the backs of cattle to kill grubs before they emerge.

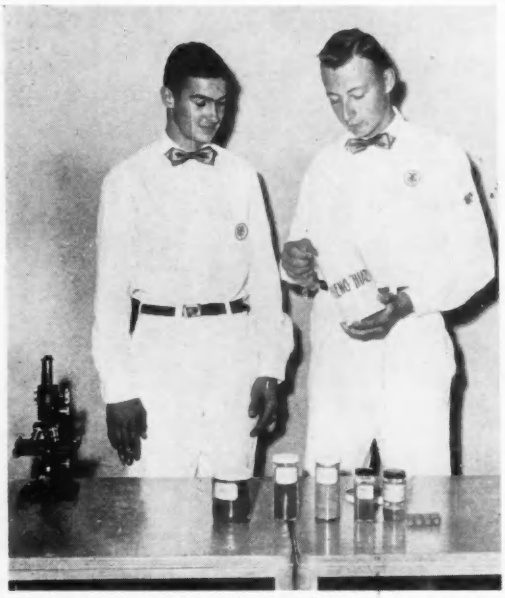
Another demonstration at the Chicago contest, also concerned with controlling cattle grubs, was presented by Bob Jackson of Independence, Mo. He also stressed the promising experimental results from the feeding of a phenothiazine-mineral mixture and actually mixed a batch as part of his demonstration, using a pound of phenothiazine to three pounds of salt, three pounds of steamed bone meal, and three pounds of ground limestone. Experimental cattle treated with this mixture, he said, have averaged only 4.5 grubs per head, against 25.1 grubs as an average for untreated cattle.

Another boy who wanted to swat parasites with chemical control was Fred Boyd of North Brookfield, Mass., who showed methods of controlling hornflies and lice on cattle. He used a model Holstein which would switch its tail and turn its head in demonstrating the ease with which methoxychlor could be applied with the hand dusting method.

One of the most elaborate and unusual demonstrations was put on by David Grunow and John McFall, a pair of 4-H'ers from Mineral Point, Wis., who showed vividly and conclusively that almost all cattle are infected with parasitic worms.

In their demonstration, the boys made actual parasite egg counts from cattle droppings they had collected. They used a centrifuge and compound microscope in much the same method employed by veterinarians and parasitologists.

But more impressive than seeing actual parasite eggs was the story told by these boys of their practical "research" in this field since starting to work on their demonstration. Each has his own beef herd and they have kept records since July 1 on



David Grunow (left) and John McFall show materials used in diagnosing and treating cattle for internal parasite control. The three bottles on the left contain various mixtures of phenothiazine. The two bottles at right contain stomach and lung worms taken from a beef animal. Stomach worms in the small bottle would cause a loss of a half-pint of blood daily, the boys say.

In July, the calf on the left was heavier of the two by 11 pounds. Both were fed the same ration except that the calf at right got phenothiazine in his feed. By October, the calf at right outweighed the other by 55 pounds. This pair is from the experimental group in the Grunow and McFall herds.

eight of their own steers. Four were fed in the usual manner, and the other four got phenothiazine on a low-level basis mixed into their regular ration.

Results after six weeks were startling. The calves that got phenothiazine outweighed the untreated calves by 25 pounds. On one pair they compared, the treated calf weighed 50 pounds more than the untreated one 90 days after the tests started.

Actual cost of this preventive treatment is less than a half cent a day per animal, the boys say. They figure that every dollar invested in phenothiazine returns $12 in feed economy and faster gain.

If stockmen aren't convinced that part of their cattle feed is being used to fatten worms rather than cattle, these Wisconsin boys have some convincing evidence gathered around their state. In their own herds, they found infection in almost every animal when they made worm egg counts. They checked 12 other herds in Iowa County with the same results. Then they took their testing equipment to the Wisconsin State Fair and found some startlingly large egg counts from the best beef cattle in the state, including a whopping 223 eggs in the standard manure sample from the Grand Champion steer.

In the heart of Wisconsin's most important beef producing area, they have begun to convince cattlemen that parasite control is as much a part of a successful beef enterprise as breeding, feeding, and management.

BETTER FARMING THROUGH CHEMICALS

By Dr. M. T. Goebel, Director of Research
Grasselli Chemicals Department
E. I. du Pont de Nemours & Co., Inc.

On August 23, 1845, Dr. John Lindley, the eminent editor of London's famed "Gardeners' Chronicle and Agricultural Gazette," wrote as follows: "A fatal malady has broken out amongst the potato crop. On all sides we hear of the destruction. In Belgium the fields are said to have been completely desolated. There is hardly a sound sample in Covent Garden Market." He described the disease, which he likened to a gangrene of the plant, and then said, sadly: "As to cure for this distemper, there is none. One of our correspondents is already angry with us for not telling the public how to stop it; but he ought to consider that Man has no power to arrest the dispensations of Providence. We are visited by a great calamity which we must bear."

This alarming statement marked the beginning of a 40-year period of distress for European agriculture which has been compared to the 10 plagues of Egypt. Although farmers had been familiar with rusts, bunts, scabs, leaf curl, and many other diseases of plants and fruits, these troubles were usually local in nature and people had learned to live with them. Now, however, the entire potato crop of northern Europe was threatened with destruction. No one knew what was causing the disease or how to stop it. This plague, which we now know to be caused by a fungus and which is still with us as the common "late blight" of potatoes and tomatoes, gravely affected the living standards of Europe for many years. It descended with particular violence on Ireland, where the potato was almost the only staple article of diet. Through starvation and emigration, the population of Ireland was reduced from more than 8,000,000 in 1845 to less than 6,000,000 a few years later.

The year 1845 also marked the first appearance, near Margate in England, of a peculiar malady of grapevines never before observed in Europe. The disease appeared on the young shoots, like a dust of white meal. It spread rapidly onto the grapes themselves, accompanied by an unpleasant moldy smell, and ended in total decay of the fruit. The new disease broke out in France, and by 1851 had swept over the whole of that country, Portugal, Italy, Switzerland, and southern Germany. The disease, which we now know as a powdery mildew, probably of Asiatic origin, also attacked the hop plant in England.

In 1868 the vineyards of France were visited for the first time by the disease now known as phylloxera, which resulted in the ultimate death of the vines.

During the 19th Century, the larch was in great demand as a timber tree because of its durability in ship building. However, at this time of calamity, the larch was also attacked by a "canker" and within 20 years the great larch forests passed away.

Catastrophe was not confined to Europe. In 1874 the

coffee plantations of Ceylon fell victim to a blight and the planters were ruined. The center of gravity in the world's coffee production shifted from the British Empire to Brazil, and the hillsides of Ceylon came to be more extensively planted with tea than they ever had been with coffee.

One may ask -- "Why should the middle years of the 19th Century, when mechanical invention, science, and medicine were all taking giant forward strides, have been marked by such a terrific series of agricultural plagues?" The answer is not entirely clear. However, the chief factor was probably the thing we have recently begun to call the "shrinking world." The great increase in the scope, volume, and speed of intercontinental commerce during the 19th Century may well have brought with it also an interchange of pests and diseases on an unparalleled scale. We know now that the potato blight and phylloxera were exported from the Americas to the continent of Europe. About 1875 the United States also exported another great pest, the Colorado potato beetle. As the pioneers reached the eastern slopes of the Rockies with fields of cultivated potatoes, the beetles, which had been observed as early as 1824, descended from the mountains, increased prodigiously, and began to travel east. By 1873 they had reached New York, swarming over the docks, and by 1877 were discovered in Europe.

As a final insult, by 1880 the American grapevine mildew, which caused little damage in the United States, became epidemic in the vineyards of France. From its characteristic effects it was known as the "brown rot." With the coming of this last plague, which we now call downy mildew, any people less dogged than the French might well have given up the cultivation of the vine in despair. However, it was the brown rot of the grapevine which finally led to one of the most dramatic chapters in the history of agricultural chemicals, the discovery of bordeaux mixture . . . .

It may be salutary, in these days of surpluses and price supports, to reflect that only the accumulated knowledge of a single century stands between even the most enlightened peoples of the world and the threat of food shortage, if not actual famine and starvation.

This is not the time to attempt a history of the science of pest control in all of its ramifications.* Suffice it to say that over the past 75 years plant pathologists, agronomists,

*Author's Note: There are a number of standard works on various aspects of pest control for any reader who wants to study further. "Advance of the Fungi", by Ernest C. Large, (Henry Holt and Co., Inc., 1940) is the source of much of the historical information in this article. Other standard references on plant pathology are:

"Fungicides and Their Action," James G. Horsfall, Chronica Botanica Company, Waltham, Mass., 1945

"Plant Diseases," The Yearbook of Agriculture, U. S. Dept. of Agriculture, 1953

"Manual of Plant Diseases" Frederick D. Heald, McGraw-Hill Book Co., Inc., 1933

entomologists, plant breeders, chemists, and agricultural engineers working as a team have gradually brought under control, though not eradicated, most of the series pests. . . .

The most important contribution which pest control and pest control chemicals make to our modern agriculture is to stabilize our agricultural production by offering each farmer a certain measure, imperfect as it may be, of crop insurance. Fungi and insects still take their toll in this country to the tune of seven billion dollars per year, as estimated by the Department of Agriculture. However, while floods, droughts, untimely frosts, and other disasters of climate may overwhelm the farmer, he now has some assurance that codling moths, boll weevils, or late blight will not suddenly descend upon his crop in any given year and completely destroy it.

The second important beneficiary of pest control is the average citizen. As this science has become effective, standards of quality have risen higher and higher and smutted wheat, ergoted rye, and wormy apples are practically unknown in today's American market. Indeed, the plant breeder and the agricultural chemist have contributed quite as much to the esthetic pleasure of the American in enjoying his food as to his national health and his national prosperity. . . .

The greatest single item in developing an agricultural chemical today is the work required to prove the safety of a new material in all respects. It must be tried out on various crops under a wide variety of climatic and soil conditions to be sure of those crops and those areas where it can be used without danger of damage. Extensive analytical determinations must be carried out over a period of years to determine that the material eventually disappears from the soil, and at a sufficient rate so that harmful residues will not accumulate in the soil in case the treatment is applied year after year. We in Du Pont consider it a responsibility of industry to make sure that accumulations of foreign material in the soil do not result from new products we may develop.

In addition, we must consider the general environment in which the new agent is to be used and make sure that it will not damage neighboring crops, contaminate water used for drinking, poison fish or game, or in any other way conflict with the public interest.

Finally, there is the all-important question of safety to human beings, and this falls into two categories. First, there is the problem of acute toxicity in all its aspects, such as toxicity on ingestion, by skin absorption, or by inhalation. . .

A much more subtle problem, and one which is much more costly and difficult to assess thoroughly, is that of possible hazard to the general public through the ingestion of trace amounts of chemicals which have been applied to crops. Actually,

the Food and Drug Administration and the United States Department of Agriculture have cooperated for a good many years to forestall such hazards. . . .

An important question which agricultural scientists and the chemical industry face today is that of the future food supply. . . .

During the 20's and 30's, it was commonly expected by actuarial and census experts that the population of the United States would level off somewhere between 150 and 160 million about the year 1980. However, the upsurge of our birth rate, which began suddenly about the middle 30's, has knocked all these forecasts into a cocked hat, and it is now predicted that the population of the United States will reach 200 million within 25 years. Beyond that it is anyone's guess, but, if birth rates continue their present trend, it is quite likely that our population will reach 300 million within the life span of some of today's college generation. If this happens, the land available for meeting the food needs of each person will drop to a figure more nearly comparable to the present state of affairs in some of the crowded countries of Europe, such as Holland, Denmark, England, and Wales. . . .

The challenge of this situation can be met in three ways. One way is to resign ourselves to a more restricted and less interesting diet. Over half of the gross farm income of the United States stems from the sale of meat, poultry, and dairy products. Since animals are always, to some extent, inefficient converters, it is obvious that we could grow more calories and pounds of protein for human consumption by reverting to a more nearly vegetarian diet.

The second approach is to increase the size of the rural population. Actually, with all our modern machinery, we grow fewer bushels of wheat per acre than do the most advanced countries of Europe, and we grow far less rise per acre than the Chinese and Japanese. Thus, it is logical to suppose that if we would cut up our large farms into small plots and, instead of having 12 per cent of our people on the farm, return to a situation where 25 per cent or even 50 per cent of our great population of the future would be engaged in subsistence farming, our total food supply might be augmented considerably. . . .

The third hope for the future is to rely on the advance of technology. Since 1920, the increased demands of our growing population have been met in part through improved farming practices and in part through the elimination of the horse, who was once an important consumer of grains. The Department of Agriculture has estimated that if all the improved farming practices now available were applied on all American farms, a further increase in production of about 30 per cent might result.

Beyond that point, the country must depend upon continued research to fill its future needs. Anyone who would attempt to point out in detail the road which will be opened by

this research would be extremely foolhardy. However, from the examples which we have discussed and those which you read about almost every day in the columns of your newspaper, I think you will conclude with me that such roads will be opened and that those who will open them will again be the team of biologists, engineers, and chemists who have done so much for American agriculture in the past hundred years.

EDITOR'S NOTE: The preceding article is abstracted from a speech by Dr. Goebel at Bowdoin College on Dec. 1, 1955. Complete text of the speech, which contains a brief but fascinating history of the foundations of agricultural chemistry, is available on request.

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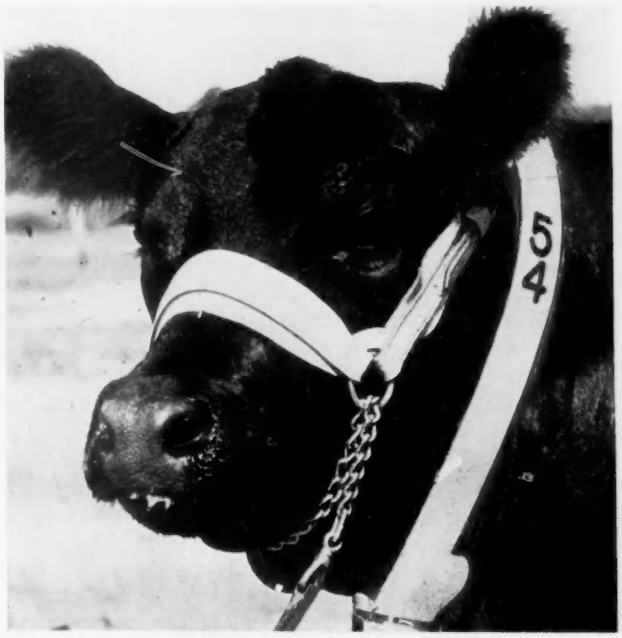
POLYETHYLENE NECK STRAPS

LATEST CATTLE INNOVATION

The Illinois farm operator who last year developed tough identification tags of "Zytel" nylon resin, to be attached to cattle collars and neck chains, has just come up with another bovine application for a modern plastic material -- neck straps of "Alathon" polyethylene resin, with the herd identification number plainly visible on each side.



This Angus show heifer from an Illinois herd models the new neck strap made of "Alathon" polyethylene resin.

The straps are of a brilliant yellow and show up well against the coat of all beef and dairy breeds. A metal buckle allows adjustment of the strap to fit any size animal. The numbers will not wear off, since they are deeply engraved and filled with a black coating of neoprene.

Due to their light weight (strap and buckle weigh less than a quarter-pound), the straps are said not to wear down the hair on the animal's neck. Calves are also reported to show less tendency to fight this strap than they do a neck chain. Since the yellow coloring is molded right into the polyethylene, there is nothing to wear off or discolor the animal's neck.

This strap, with up to three digits on each side, is being made to sell for less than a dollar.

$19 FOR FERTILIZATION PAYS

$115 DIVIDEND IN RICE CROP

An increased return of at least $115 per acre from Arkansas rice fields, resulting from an investment of about $19 in fertilizer and application costs was shown in fertilizer experiments at the University of Arkansas' Rice Branch Experiment Station at Stuttgart, last year.

Final results of the test, harvested by combine on October 18, showed average yields of 63 bushels per acre on the unfertilized plots, compared with 137 bushels from plots fertilized with the best treatment. Plots yielding this 137-bushel average -- 74 bushels better than the unfertilized acres -- were treated with 90 pounds diammonium phosphate and 140 pounds of urea used as a topdressing.

Smallest yield recorded from a single unfertilized plot was 57.1 bushels per acre, while the record plot yield from any of the fertilizer combinations was 143.9 bushels per acre. This top yield was in response to a treatment with 266 pounds of urea fertilizer per acre as a top dressing on drained soil before the second watering. This was followed by an additional application of 500 pounds of 8-8-8 liquid fertilizer injected into the second irrigation water. Average yield from four replications of this treatment was 125.2 bushels per acre -- 11.8 bushels under the average of the best yielding treatment discussed above.

The data showed an average increase of more than 117 per cent between the best yielding plots and the unfertilized rice. This was credited to the use of adequate fertilizer as an adjunct to recommended watering and management practices which were carried out on all plots alike.

In previous experiments, applications of most nitrogen fertilizers at heavy rates -- 80 pounds actual nitrogen per acre or more -- frequently resulted in serious lodging and harvesting trouble with tall varieties. In the 1955 experiments the shorter Bluebonnet 50 variety was used in all tests and no serious lodging occurred.

EDITOR'S NOTE: Urea fertilizer for application as described in the above report is manufactured by the Du Pont Company and available under the trademark of "NuGreen" fertilizer compound.

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TO KILL SANDBUR -- Most economical control of field sandbur in many areas may be obtained with the use of soil sterilants such as the "Karmex" herbicides, according to a recent bulletin from the California Agricultural Experimental Station. Label instructions should be followed carefully in using any of these substituted urea weed killers.

BALANCING HIGH-ENERGY FEEDS FOR GREATER EFFICIENCY

by Dr. James Waddell
Grasselli Chemicals Department
E. I. du Pont de Nemours & Co., Inc.

In this period of declining feed ratios for egg and broiler producers, there is more and more concern about feed efficiency. Each new nutritional development is gauged on the basis of what it will produce compared with what it will cost. Thirty years ago, a typical starting ration contained less than 10 ingredients. Now, a chicken starts off on a ration containing over 30 ingredients.

A poultryman feeds his birds for only one reason -- to make money. And the birds have only two reasons for eating: (1) to supply energy for heat and muscular effort; (2) to produce and maintain tissues -- meat and eggs. The poultryman's profit comes from getting the birds to do their job at the lowest net cost by improved performance on less feed.

United States Department of Agriculture ratios show that in 1925 a pound of meat would buy 8.1 pounds of feed, while in 1952, a pound of meat would buy only 6.2 pounds of feed. But this is only part of the story. It took 4.39 pounds of that 1925 feed to produce a pound of meat, while 2.67 pounds of the 1952 feed would produce a pound of meat.

In other words, while the feed ratio had dropped about 23 per cent, feed efficiency improved by about 40 per cent. So, mathematically, the broiler grower has more than held his own because of greater feed efficiency. With eggs, production per layer has increased 61 per cent, while the egg feed ratio has dropped 25 per cent. (See accompanying charts.)

But where do we go from here? What is there is present-day poultry nutrition research that promises further improvement in feed efficiency? Sources of energy and protein are still the most expensive portion of most rations. So the relationship of energy to protein and its component amino acids has received increasing attention.

Much of the improvement in the performance of poultry diets during recent years has come about because of a better understanding of the value of increased energy levels. The trend in this direction was started in 1947 when the Connecticut broiler ration was first introduced.

While the original formula was considered to be impractical for wide commercial use, the results which it produced emphasized the great improvement in rate of growth and efficiency of feed utilization which could be obtained from a properly supplemented high-energy diet. The phrase, "properly supple-

mented," is the key to the whole problem because we are just learning how important it is to balance the energy content with the proper levels of other nutrients.

The energy content of a diet has a marked effect on the amount of feed that an animal will consume. Generally, the higher the caloric content the less that is eaten. This means that to obtain optimal results, the amount of feed consumed must provide all the nutrients needed to support rapid growth or high production.

Thus, if any nutrient is borderline or deficient in supply in a diet, increasing the energy content is of little value because the deficiency is made worse and definitely limits the response. Such a deficiency is less likely to occur in the vitamin and mineral nutrients in modern diets than it is in the amino acids supplied by the protein.

Recent work has shown that the proper balance between energy and protein is highly important, affecting not only the production performance of the birds but also their body composition and such phenomena as rate of feathering and the incidence of feather picking.

That there is a precise quantitative relationship between energy intake and requirements for specific amino acids has been shown by work reported earlier this year by investigators in the Du Pont Stine Laboratory. These workers formulated diets which contained the same amount and mixture of proteins (low in methionine) but different levels of energy.

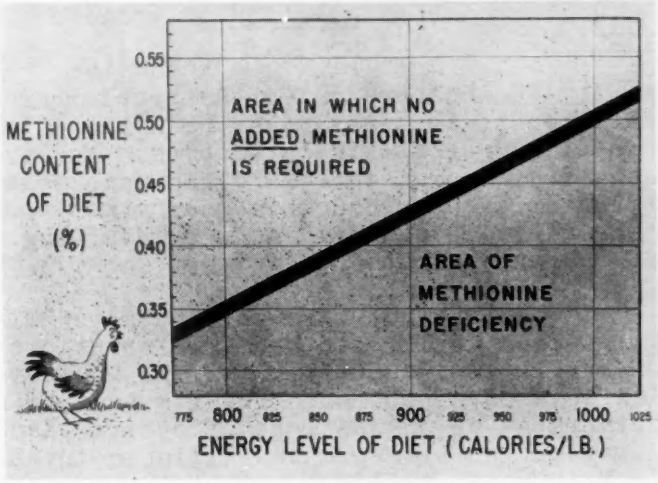
When groups of chicks were fed these diets, supplemented in each case with graded doses of methionine, it was found that the birds responded to increasing methionine supplements in exact ratio to the energy content of their diet. In

TABLE 1

METHIONINE AND PRODUCTIVE ENERGY CONTENT OF FEED INGREDIENTS

Ingredient	Methionine %	Productive Energy Cal. per Lb.
Corn	0.20	1150
Soybean Oil Meal (44%)	0.79	570
Peas	0.22	888
Fat	-	2900
Fish Meal	1.80	900
Alfalfa, dehydrated	0.40	300
Cond. Fish Sol.	0.60	400
Corn Gluten Meal	1.00	840
Wheat	0.25	1020
Oats	0.25	760
Cottonseed Meal	0.70	660
Wheat Flour Midds.	0.30	720

other words, there was a linear relationship between energy level and the amount of methionine (expressed as a percentage of the diet) needed to obtain a maximum response in growth and feed conversion.



This is a simplified version of the graph which shows the methionine requirement of the chick as related to the productive energy content of the diet. The vertical measurement represents the per cent methionine content of the diet, and the horizontal measurement is the productive energy content of the diet in calories per pound.

In a chart accompanying this article is a graph which shows this quantitative relation between energy content and methionine requirements. It should be noted that the slope and position of this line reflect the values for productive energy and for methionine content of the various diet ingredients as shown in Table I. If different values are used, a new line would have to be constructed.

In broiler diets based mainly on corn and soybean oil meal it has been known that the first limiting amino acid was methionine. The working out of the above relation between energy content and methionine requirements has been of great value in determining which diets can be improved by the addition of this amino acid and in estimating how much should be added.

Commercial experience has shown that, when methionine is the main deficiency, it is highly profitable to add the synthetic DL-methionine at its present price. It has also been found that many commercial formulas, by the addition of a small amount of methionine, could be made to support an appreciable increase in energy content with a resulting improvement in their ability to promote growth and efficient feed conversion.

But what about the levels of the other essential amino acids? As the energy content of a diet is increased, even with the addition of methionine, we inevitably come to a deficiency of some other amino acid or acids.

The crux of the problem will be to identify those which are likely to be deficient in the protein mixture we are using. Then we can take steps to increase their supply either

by an increase in quantity of protein or a change in its quality.

An approach to the problem of supplying amino acids in relation to the energy has been the calorie/protein ratio suggested by certain investigators. For example, Dr. G. F. Combs and his associates at Maryland have proposed a ratio of around 42 calories of productive energy per pound for each per cent of "effective" protein in a chick starting mash as an approximation of the proper ratio.

Other workers have questioned this ratio, stating that it was not applicable over different protein levels or different energy levels. Recently, Dr. H. M. Scott and his associates of Illinois have published results indicating that a calorie/protein ratio of 50 was more effective than a higher or a lower one. However, in this work the Illinois investigators were using a diet in which a major part of the protein was furnished by casein.

It seems that in addition to thinking in terms of total protein it is time to think also in terms of definite amounts of specific amino acids supplied by the protein. There is every reason to believe that there exists for each essential amino acid a similar relationship between requirements and the energy content of the diet as for methionine.

Indeed, there was very recently reported from the Du Pont Stine Laboratory experimental results indicating that such a relationship also exists for the amino acid, lysine. It is probable that the differences in calorie/protein ratios obtained by different workers arose from different protein mixtures used by them and that in terms of supply of specific amino acids their results are very comparable.

It is unfortunate that the estimated requirements of the chick for the essential amino acids such as have been published by the National Research Council (Nutrient Requirements for Poultry, revised January 1954) have not been related to specific energy levels. We have no reason to doubt that this will be done ultimately but it is going to take time.

In the meantime, the nutritionist in formulating a high-efficiency diet should routinely calculate the levels of such amino acids as arginine, lysine, tryptophan, methionine and cystine. These have been considered to be the ones most likely to be in critical supply.

Any deficiency of the sulfur amino acids can be made up by the addition of synthetic methionine using the methionine-energy line to estimate the amount. The other amino acids, however, still must come from the protein in the diet and the protein supplements must be used in an amount and variety to yield adequate levels of them.

In the absence of precise information as to the effect of energy level on requirements for these other amino acids we can recommend only that they be present in an amount equal to, or in excess of, the National Research Council Requirements.

We are in an era of what has been called "high-octane" feeds. Each additional ingredient not only costs money, but adds to the labor of manufacturing the feed. Thus, it is well worth-while for poultry nutritionists to consider calorie content and critical nutrients together -- to obtain greatest feed efficiency. Calories can be wasted because of nutrient deficiencies and nutrients can be wasted for lack of productive energy to meet the birds' requirements.

With the advent of more precise information both on nutrient content of feedstuffs and nutrient requirements of animals, The feeder must be re-educated to evaluate feeds by their production potential rather than the price per bag.

EDITOR'S NOTE: The above article is reprinted from the January, 1956 issue of "Hatchery and Feed."

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CROP RESIDUE TOLERANCES FOR SUBSTITUTED UREA HERBICIDES

Residue tolerance levels for the active ingredients of "Karmex" herbicides have been established by the Food and Drug Administration. The commercial formulations affected are "Karmex" W, based on 3-(p-chlorophenyl)-1,1-dimethylurea; and "Karmex" DW and "Karmex" DL, both based on 3-(3,4-dichlorophenyl)-1,1-dimethylurea. Tolerances of one part per million for each of the two herbicide chemicals have been established for sugar cane, pineapple, and cottonseed, and in addition the same tolerance has been established for the active ingredient of "Karmex" W in or on asparagus, spinach, and dry bulb onions.

Du Pont toxicological studies with these chemicals indicate that this tolerance represents a very large safety factor. Even for materials of such relatively low toxicity, tolerances are being based on the amount of residue likely to be left when the chemical is used according to good cultural practice. Actual analyses of crops produced in fields where "Karmex" herbicides have been used indicate that normal residues are well within the tolerance which has been established.

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METHOXYCHLOR ON PASTURES -- According to reports from the Beltsville, Md., USDA research center, quoted in "Veterinary Medicine," methoxychlor has again proved a safe insecticide for use on pastures grazed by dairy cattle. Cows there grazed treated pastures for 40 to 80 days. While the forage carried residues ranging from 16 to 100 parts of methoxychlor per million of roughage, none of the insecticide was detectable in the milk.

FOR SPRAY RIG, NEOPRENE

HOSE CAN SURE "TAKE IT"

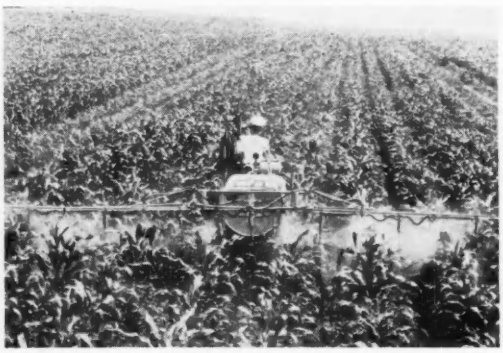
One product which chemistry is contributing to the modern farm operation is saving a good deal of money, time, and temper -- but without any great amount of recognition. The product is longer lasting hose!

Wherever spray rigs apply insecticides, weed killers, fungicides; wherever ammonia fertilizers are applied, or flame cultivation practiced, it takes considerable hose to distribute the material from the tank to the nozzles or other types of applicators.

As an example of the way the chemical industry has helped solve a serious hose problem on such equipment, let's take the case of a southern farm-implement manufacturer. When this company first began manufacturing liquid ammonia applicators, it furnished hose with a natural rubber cover. Sun-cracking was severe and the hose rarely gave more than a year's service.

The company soon changed to hose with a cover of neoprene synthetic rubber. Service department records now show an average hose life of three years, and the predominant cause of failure is mechanical damage rather than deterioration. On some farms, neoprene hose is reported still in service after seven years' use.

This manufacturer now supplies neoprene inner lining, or tube, as well as neoprene cover, for all hose on all applicators he produces. For besides withstanding the degradation sunlight produces in natural rubber, neoprene is highly resistant to most oils, greases, and chemicals. This is important, of course, since farm sprayers are usually used for more than one purpose and a hose that can stand up to ammonia, propane, and a variety of pesticides (some of them in oil emulsion) is a real asset on any rig.



Sun beating against the outer cover of the spray hose and oil emulsion insecticide sprays on the inside can ruin ordinary rubber. Neoprene hose will give three times the service life or more under such circumstances.

Through the welter of hose on the back of this tank passes anhydrous ammonia fertilizer on its way into the soil. Here's a place where hose life has been materially lengthened through the use of neoprene.

A NEW YEAR!

An Editorial

About all we personally can tell about it from this vantage point is that it will bring joys and sorrows, failures and success, and 12 months.

This will be a year, like all years, when we will make history, hay, and progress. The most important question we might ask is: "Which direction will that progress take?"

In the past decade, all of us have taken what we felt were great strides towards the solving of many problems -- in agriculture, in industry, and in everyday life. But in retrospect, we really haven't traveled far along any of these technological or sociological paths.

The editor of a highly respected publication for orchardists, visiting us recently, made the rather startling comment that "what farmers want is really efficient control for plant diseases." In answer, we mentioned some of the modern organic fungicides, which over the past 15 years have built a really enviable reputation in the control of many such diseases.

"Of course," he agreed, "in comparison with the old inorganic materials they have done wonders. But the grower still has to outguess the weatherman to know when to apply them, and then must make a dozen or more applications a year. What he wants is a chemical to be applied only two or three times during the growing season -- which will not be affected by weather, and will give him the same sort of control."

And after the chemical industry has come up with such a product, as someday it undoubtedly will, there will be great demand for a better fungicide which can be applied just once, in the early spring. And once this is developed, growers (if they continue to be human) will begin asking for a material which can be injected into the plant or even into the seed to keep it disease-free for life. Indeed, it will be surprising if the chemical industry arrives at this stage in its battle against plant diseases and equally surprising if plant breeders make possible the purchase of plants and trees with bred-in immunity to all diseases.

Well, of course all these things aren't likely to come to pass during this new year we are entering. But inquisitive minds and sure hands in laboratories, at experimental stations, and on farms -- encouraged by the rewards which only a free and independent society can offer such accomplishments -- will be pushing the limits of knowledge in the direction of those goals.

And if we are to continue to enjoy the fruits of "progress" of this sort, we must see to it that our national and social "progress" in 1956 takes a direction that will continue to make both individual and collective initiative and inspiration worth while.

EXPERIMENTERS' NOTATIONS

A Round-up of Data from Across the Nation

Asparagus is being recommended as a new crop for the Arkansas River Valley following extensive research at the Arkansas Valley Vegetable Substation at Van Buren. Yields from station plantings have ranged as high as 4,000 pounds per acre, compared with an average of 3,000 pounds or less in eastern areas. Weed control has been achieved with the use of "Karmex" W herbicide, which has been used for several years in other asparagus areas of the nation.

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Low-level feeding of phenothiazine improved winter performance of beef steers in Oklahoma during a 154-day feeding test last winter. One group of 34 steers averaged three pounds gain per head during the period, on a daily ration of two grams of phenothiazine, two pounds of 41 per cent cottonseed cake, and 14 pounds of prairie hay. A similar group of 35 steers, fed the same ration except for phenothiazine, averaged only two pounds gain during the test.

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The protein content of cornstalk silage was found to be appreciably increased when high nitrogen applications (300 pounds nitrogen per acre) were made to the cornfield, in Iowa State College Experiments. Analyzed as it was being fed in midwinter, the silage was found to contain 17,000 international units of vitamin A activity per pound of dry matter. This is believed ample in meeting vitamin A requirements of pregnant beef cows. Also, nitrate nitrogen was examined and found to be 150 to 400 parts per million of dry matter, or within a safe feeding range so far as toxicity to cattle was concerned. The moisture content of the cornstalk silage was about 68 per cent at the time of feeding. It had taken on a sweet silage aroma and was consumed with relish by the cows.

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When EPN and parathion were applied in peach orchards near Moorestown, N.J., for control of plum curculio, the effect of these sprays on oriental fruit moth was also so studied and has recently been reported by M. H. Brunson of USDA. Compared with orchards sprayed with lead arsenate, orchards receiving EPN or parathion sprays showed reductions of 80 per cent of overwintering-brood moths, reductions of 90 per cent of first-brood moths caught in traps, 95 per cent fewer twigs infested with first and second brood, and 90 per cent less injury on ripe fruit.

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